A DESCRIPTION OF A NEW PHOTOGRAPHIC TRANSIT INSTRUMENT.

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A camera lens of wide field is mounted at one end of a rigid tube built up of small angle irons. At the other end is the plate carrier. Adjustments for collimation, base and focus are provided. On the under side of the tube not far from the objective is a ball which fits into a socket mounted on a pier, and these form the polar axis of the instrument. The lower end of the tube rolls on a glass plate attached to the same pier, the latter pointing to the intersection of the celestial equator with the meridian. To the camera is attached a driving clock regulated to the sidereal rate. The glass plate is adjusted to the celestial equator and in this way round star images are obtained on the photographic plate. Near the lower end of the camera is attached an electric contact which operates on a hinge without lost motion. As the driving clock moves the camera across the meridian this contact falls by its own weight into a number of slots in succession, cut into a brass rod that forms the other terminal of an electric circuit. In this way we obtain upon a chronographic sheet eight sharp and short signals every minute. The same circuit contains a sidereal clock and thus we have the means of finding at what times the camera passed the slots in the brass rod.

The method of observation is as follows: two or three minutes before a certain group of equatorial stars comes to the meridian, the driving clock is started and the lens is uncovered just before the contact falls into the first slot. The exposure lasts say five minutes, the camera being covered just after the contact has passed over the last slot. Without disturbing the plate in any way the camera is moved back to its original position so as to point again a few minutes east of the meridinan. Some time later the process is repeated on

another group of equatorial stars, and the plate is then taken out of the camera and developed. It is clear that the two sets of chronographic records, together with the measurement in right ascension of the two exposures, will give us the right ascension of one group if that of the other is known; similarly for the declinations, except of course that the clock is not involved.

The method is liable to several sources of error: (1) accidental errors in the measurement of the plates and of the chronographic records. (2) Errors in the assumed rate of the clock. (3) Errors due to the movement of the pier in the interval between the two exposures. It is certain that the first of these is smaller than in the best work that is possible by visual methods, and in addition we are freed from personal equation in all its forms. This observatory possesses an excellent Riefler clock whose rate for ten hours (the longest interval between exposures that it is feasible to employ), we should be able to determine with a probable error not exceeding 0.005 second of time. Several years ago we set up a stationary camera upon a pier pointed at the polar regions and secured exposures every few minutes on a number of stars. The measurement and preliminary discussion of these plates proved that the pier is liable to very small movements during the course of a single night, and the error from this source is not greatly to be feared.

We have constructed such an instrument as this in the observatory shops from such material as we happened to have at hand. A trial of it has encouraged us to reconstruct it in more permanent form, and in particular we are having made for it an accurate driving sector and worm. It is proposed to put the method and instrument to a very severe test by extending the observations through an entire year, coming back to the group that forms our starting point by means of six steps.

The camera is being tried in the equator only because this simplifies the construction. A slight and obvious modification will make it applicable to any declination whatever. In this more general form the device, if successful, will enable us to ascertain the right ascension and the declination of stars in any portion of the sky providing that we know beforehand the positions of any other stars in about

the same declinations. The instrument is intended for coöperation with the meridian circle in the determination of the positions of several hundred comparison stars in a narrow zone, upon which in turn can be based the compilation, by photographic observations, of zone catalogues of many thousands of stars.

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